Bioversity International

Embracing diversity: inputs for a strategy to support community seedbanks in South Africa's smallholder farming areas

Report of field visits to Limpopo and Eastern Cape

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Bioversity International is a world leading research-for-development non-profit organization, working towards a world in which smallholder farming communities in developing countries are thriving and sustainable. Bioversity's purpose is to investigate the use and conservation of agricultural biodiversity in order to achieve better nutrition, improve smallholders' livelihoods and enhance agricultural sustainability. Bioversity International works with a global range of partners to maximize impact, to develop capacity and to ensure that all stakeholders have an effective voice.

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The Department of Agriculture, Forestry and Fisheries (DAFF) is a national sphere of the South African government responsible for implementing the laws and policies decided by the South African parliament. It specifically derives its core mandate from section 27 (1) (b) and (2) of the South African Constitution which is to: "….take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of the….right (of everyone) to have access to sufficient food." Within the DAFF and more specifically the Agricultural Production, Health and Food Safety Branch of the DAFF, the Directorate Genetic Resources is mandated to regulate and provide an integrated national management system in support of the conservation and sustainable use of genetic resources for food and agriculture. This involves the development and implementation of policies, legislation, strategies and norms and standards on the management of genetic resources for food and agriculture, the regulation and promotion of propagating material of genetic resources for food and agriculture and to provide for a risk mitigating system in support of agricultural biodiversity.

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Front cover (at the Mutale seed fair) and inside photos: Ronnie Vernooy.

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1. Introduction

Background of the study

As in many other countries, South Africa's smallholder seed systems are increasingly coming under pressure. Factors such as drought, crop failure, difficult storage conditions and poverty are having a negative impact on both the quantity of seed and the number of plant varieties available to farmers. In addition, as a result of agricultural modernization, farmers are increasingly purchasing more of their seed requirements and loosing traditional knowledge and skills of selection and seed storage. In order to turn the tide, community seedbanks are considered by the Department of Agriculture, Forestry and Fisheries (DAFF) of the Government of the Republic of South Africa as a means to strengthen the informal seed systems, support conservation of traditional farmer varieties and maintain seed security at district and community levels.

The Departmental Strategy on Conservation and Sustainable Use of Genetic Resources for Food and Agriculture proposes, among other focus areas, both *ex situ* and *in situ* conservation of Plant Genetic Resources for Food and Agriculture (PGRFA). South Africa has a well developed *ex situ* conservation facility, namely the National Plant Genetic Resources Centre (NPGRC), where accessions of plant material are maintained. The mandate of NPGRC has recently been extended to also include community seedbanks as a strategy to promote on-farm management and conservation as a key component of the country's *in situ* conservation strategy. In order to fulfill this mandate, NPGRC considers capacity development of its frontline staff as an important strategy. Capacity building should empower farmers through strengthening informal seed systems, supporting the conservation of traditional farmer varieties, and maintaining seed security.

Research questions

In order to assist the NPGRC with its new mandate and capacity building efforts, an international research team of two Bioversity International staff and four staff from the Department of Agriculture, Forestry and Fisheries (DAFF) of the Government of the Republic of South Africa to carry out field visits to Limpopo and Eastern Cape to find answers to questions such as:

To what extent are farmers still engaged in growing landraces? What are the main factors influencing the choice of crops and crop varieties? Is there loss of diversity occurring? Are farmers experiencing the impact of climate change? And if so, how are they responding? Are farmers saving seed on-farm or at the community level? Are farmers exchanging seeds, with whom, when, and how? Are these practices changing and how? What do they think about a community seedbank?

Sites

Two important farmer smallholder areas of Limpopo and Eastern Cape provinces were selected for the field study: Mutale and Sterkspruit.[1] Farmers in both regions live and work in landscapes characterized by tough conditions including: low rainfall levels in both sites; cold and windy weather conditions in the mountainous areas in Eastern Cape; and poor accessibility and distance from major markets in both sites. However, they still manage to make a living. They produce food mostly for subsistence, but also succeed in producing small surpluses for marketing. Crop and varietal diversity combined with diverse animal husbandry practices (cattle, sheep and goats) is central to their farming systems and to survival. However, in the last few decades, several crops and crop varieties have disappeared and/or seeds have become hard to obtain. Farmers' capacity to select from a range of crop species is limited. Research targeting such difficult situations is minimal. As a result, traditional crops and varieties are the lifeline of farmers' livelihoods.

Schedule, methodology and tools

Limpopo: 5-8 August 2013, two days of fieldwork, approximately 1500 km travelled.
Eastern Cape: 12-16 August 2013, three days of fieldwork, approximately 1500 km travelled.

The research team made use of a number of simple to use but effective participatory tools, such as seed fair, four cell analysis, seed network mapping, seed survey and historical trend analysis (for more details about the tools used, see CIP-UPWARD 2003, Sthapit et al. 2012. For the NPGRC team members it was the first time to use these tools. They observed that the tools allowed close and lively interaction with farmers; farmers easily grasped the purpose of the tools and could implement them out without problems; the tools facilitated

[1] Both areas were included in a small project on *in situ* conservation of agricultural biodiversity implemented by the DAFF some years ago. One of the suggested follow up activities emerging from that project was the establishment of a community seedbank. This suggestion remained without concrete action from DAFF's side until recently. One of the study mission's goals was to reassess the necessity and viability of establishing one or more community seedbanks in both areas.

obtaining information and getting to the bottom of issues; and overall the tools offer a comprehensive view of crop diversity at farm and community levels. The following photos illustrate the variety of tools used during the field work. Table 1 presents the tools used and research activities that were carried out by the research team in cooperation with extension agents of the Mutale municipality in Limpopo and Joe Gqcabi municipality of Eastern Cape. Annexes 1-2 present the results of the farmer surveys carried out in both areas. Surveyed farmers were selected from different villages present at the seed fares in Mutale and Sterkspruit.

Table 1: Field research activities and participatory tools used

Activity	**Limpopo**	**Eastern Cape**
Seed fair (inventory, display)	10 villages, 45 farmers registered seeds, 55 farmers in total, 95% women, 18 crops displayed*	6 villages, 15 farmers, 95% men, 16 crops displayed**
Seed exchange	Only a few exchanges at the seed fair	Yes: at the seed fair and during the field days
Historical trend analysis	No	Yes, with 6 villages
Four cell analysis for crops	2 villages with high levels of crop diversity: Gumbu and Phalama 1 village with high varietal diversity (sorghum): Manenzhe	6 villages
Four cell analysis for crop varieties	During the seed fair, plus 2 villages (sorghum)	During the seed fair, plus 1 village (maize)
Seed network mapping	3 villages	6 villages
Farmer survey	8	12
Informal interviews with extension agents	Yes	Yes

*During the field visits, 14 more crops were identified as used by one or more farmers (but no seeds were displayed)

**10 at the seed fair plus six more during the field visits

Photos Mutale, Limpopo and Eastern Cape (EC)

Photo 1: Seed fair (Mutale, Limpopo)

Photo 2: Seed exchange (Ndopela, EC)

Photo 3: Trend analysis (Sterkspruit, EC)

Photo 4: Four cell analysis (Dangershoek, EC)

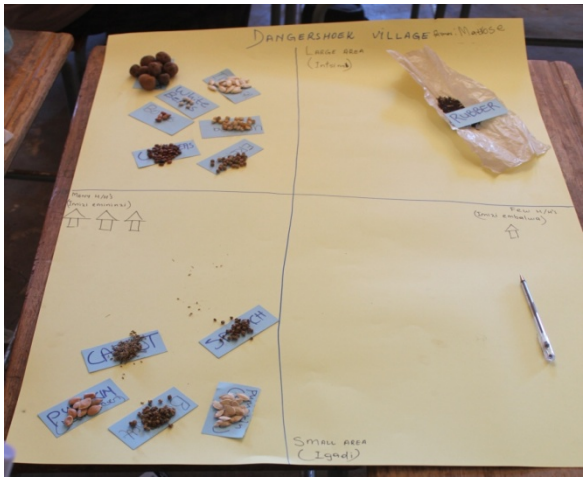


Photo 5: Seed network mapping (Mutale)

Photo 6: Farmer survey (Ndopela, EC)

2. Findings from Mutale, Limpopo

Mutale seed fair

A municipality level seed fair was held at the premises of the Mutale Agriculture Offices. About 55 farmers, mostly women, from 10 villages took part. The seeds of crops they brought were registered by an agricultural advisor prior to the seed fair. Farmers brought seeds tied and displayed in plastic bags. It was suggested that for future seed fairs calabash shells could be used allowing a clearer display and visual identification of seeds. This could be organized by the DAFF officials. Farmers were then briefed about the purpose of the day and invited to visit the display which was organized inside a meeting room at the premises. The display of seeds was first arranged by crop which gave a good overview of crop diversity across the ten villages but did not allow for assessing diversity by village. The municipal level survey data indicated that farmers maintain between one-four grain crops, two-seven vegetable crops and nil-four fruit species for a total range of three-fifteen crops, with an average of nine.

After a go around of the display, farmers were invited to reorganize the display by village and rotate amongst villages to exchange seeds. The experience was interesting and farmers demonstrated much enthusiasm. However, actual seed exchanges were limited. This could have been due to poor communication about the purpose of the fair or because farmers are not very used to this kind of exchange mechanism or, in general, do not exchange seeds regularly among villages because of social taboos or lack of information.

Gumbu village: “The rains have not come for too long”

A field visit to Gumbu village allowed obtaining a more in-depth understanding of farmers’ practices to maintain crop diversity. Gumbu is a remote dryland village situated about 150km from Mutale town near the border with Zimbabwe with poor access to the market and far away from government agencies and services. Close to 40 farmers, mostly women, gathered to conduct a four cell analysis of village level crop diversity. They brought and displayed a total of 28 local crops. The four cell analysis was conducted to categorize crops according to utilization by many households or few households, in large areas or in small areas and to find out common and rare/unique crops and varieties and the reasons for doing maintaining them (see photo 7). The results are summarized in Table 2 overleaf.

Table 2: Four cell analysis in Gumbu village

Small area / Many households -*beans* (nawanawa): side dish, easily attacked by pests and diseases requiring constant monitoring	**Large area / Many households** -*white sorghum*: staple food, also used for beer brewing -*maize*: staple food -*calabash*: staple food and ornamental plant -*cowpea:* cash crop, side dish -*pumpkin*: intercropped with sorghum -*melon*: easily mixed with 'mealiemeal'*, drought resistant -Bambara nut, groundnut: cash crop -*finger millet*: chicken feed
Large area / Few households	**Small area / Few households** -nightshade (a wild vegetable), sunflower, wheat: require abundant watering -*lucern*: for livestock feeding -*pigeon pea*: lack of seeds -cabbage, cucumber, garlic, gem squash, okra, onion, pea, spinach, sweet potato, tomato: require irrigation and constant monitoring -*tobacco*: only for own consumption

*grounded maize pap (puree)

The analysis indicates that many crops in Gumbu are cultivated by many households in a large area because they form part of their staple food. Farmers mentioned that cultivating these crops is affected by climate change, in particular changing rainy seasons. They also observed that the natural seed treatment they used to apply is no longer effective. Rising food prices have forced many farmers to consume all their resources leading to loss of seeds. Farmers survive on vegetables cultivated in their small gardens, but water supply is a serious problem. Most exotic seed comes from the market. Livestock were previously used for tilling the land but lack of grazing land has reduced their numbers. Farmers find it difficult to afford tractors. Asked about seed exchanges, farmers replied that they do not practice such exchanges very much. They expressed strong interest in the establishment of a community seedbank considering that it could halt and reverse the genetic erosion that is occurring and at the same time stimulate seed exchange. As an example, they mentioned that they had lost six sorghum varieties over time.

Photo 7: Four cell analysis in Gumbu village

Interviews with women farmers of Gumbu village

Interviews with four women farmers revealed that most farmers in the village are maintaining more vegetables than grain crops. Farmers contend that they maintain a range of different species and varieties because they inherited the culture from their parents; crops are consumed by household; variety gives them satisfaction and allows them to earn some extra cash; seeds and leaves are used for decoration and cultural celebration; and rare species are adapted to local weather and soil conditions. Crop varietal diversity at farm level is not very high. Some farmers maintain rare varieties.

Seed exchange mostly takes place within the family and with fellow church members. Trust is a key driver for exchange of seed as they would like to ensure local adaptation to specific land types. Crossings are practised by everyone for crop improvement. Interviewed farmers expressed a concern about the loss of diversity in particular because the upcoming generation has lost interest and faith in farming. They consider that financial support/compensation will encourage farmers to continue cultivating indigenous crops instead of commercial crops. They reiterated that exchange of seeds amongst farmers of different communities and cultures was welcomed and they are interested to develop a community seedbank conservation strategy.

Phalama village

Phalama is a centrally situated village not very far from Mutale town with good access to the market and government agencies and services. There are about 150 households. Due to time constraints to organize a village gathering, a four cell analysis was carried out with only two women farmers (both had attended the seed fair in Mutale). The results of the analysis are presented in Table 3. This four cell analysis depicts quite a different picture of crop diversity than the one conducted in Gumbu village. This could be partially due to the small number of participants, but information received from the extension officer working in the village largely confirms the lower level of crop diversity here (see photo 8). The two women farmers clarified that the market is important for them both to sell crops (including fruits) and to purchase goods. Sometimes they purchase seeds from the Mutale Cooperative. The two women farmers asked about the possibility to establish a community seedbank indicating that some concern exists in the community about the loss of crop diversity.

Photo 8: Display of crop diversity in Phalama village

Table 3: Four cell analysis in Phalama village

Small area / Many households - *red and white groundnut*: susceptible to pests and diseases requiring constant monitoring -*cowpea (nawa)*: limited land area -*calabash*: requires monitoring, side dish, ornamental use -*nightshade*: requires irrigation, used as a side dish -*green pearl millet*: attacked by birds, requiring constant monitoring -*black pearl millet*: used for beer brewing and making 'mageu'**	**Large area / Many households** -*maize*: staple food*
Large area / Few households -*sorghum:* staple food -*watermelon*: cash crop	**Small area / Few households** -*pumpkin*: a few satisfy household needs

*Drought has affected large areas and some farmers have had total loss of the crop.

** A popular non-alcoholic drink made from fermented mealie (maize) pap.

Manenzhe village

This dryland village is located about 75km from Mutale. It has reasonably good access to the main road to the district capital. Of the 350 households, approximately 60 farmer households practice farming. This village distinguished itself at the Mutale seed fair by showcasing seven varieties of sorghum (some can be seen on photo 9). A four cell analysis was carried out to obtain a more detailed understanding of this intra-species diversity. The seven varieties were characterized as follows:

- Mafestere: grown in a large area by many households, staple food, sweet taste, drought tolerant and short growing cycle.
- Tshikotane: grown in a large area by many households, staple food.
- Lungamshiwa: grown in a large area by many households, staple food.
- Lundente (meaning: waving a lot) and 'matepe'): grown in a large area by few households. Both these varieties are very nutritious and are used for beer brewing and making 'mageu.'
- Tshiphufu (meaning: short): grown in a small area by few households. The white coloured variety is used for porridge, the red coloured variety for chicken feed; these are a newly introduced varieties (by the extension staff) not yet well known.

- Nkhwe (a sweet sorghum): grown in a small area by few households, used for porridge; lack of seeds.

Interviewed farmers mentioned that they lost some varieties in the last three years: Nyamungodwana, Sekgabane and Lintlade.

Three women farmers were interviewed to obtain an idea of seed exchanges. Focusing on sorghum, the seedflow map (see photo 9) gives evidence of a fairly dynamic pattern of exchanges based on a variety of relationships of kinship, friendship, acquaintance and church membership. Seeds were also exchanged with unknown farmers from other villages. The interviewees confirmed that this pattern was common for all crops and not only sorghum.

Photo 9: Seed network mapping in Manenzhe village

3. Findings from Sterkspruit, Eastern Cape

Sterkspruit seed fair

A municipal level seed fair was held at the premises of the Agriculture Office. Ten farmers from four villages from the north eastern and eastern part of the municipality took part (eight men, two women); the villages are Ndofela (meaning, "I will die here"), Qhoboshane (meaning, "at the border"), Spambo (only one farmer) and Phelandaba. The seeds of crops they brought were first registered and then displayed by village inside a meeting room at the premises. Farmers were briefed about the purpose of the day and invited to take part in a number of participatory analyses of crop diversity. Lively discussions followed in which farmers, extension staff and the research team actively took part.[2] The municipal level survey data indicated that farmers maintain between nil-five grain crops, two-eight vegetable crops and nil-five fruit species for a total range of three-sixteen crops with an average of ten.

Crop diversity in the villages[3]

In Ndofela, maize is the main staple crop; five varieties were on display at the seed fair (see photo 10). Farmers explained that they conserve varieties of maize because they have inherited them from their forefathers. Farmers mix short cycle (three months) yellow and white maize found to be drought resistance. White maize is tasty and sweet. Gaziteyketya is a white maize variety with a dent in the middle. Matinyane is a white dominant maize variety with a few black seeds. Farmers cultivate maize using organic manure.

In Qhoboshane, farmers call the most popular white maize 'three months.' It can be planted in December and harvested in February. Farmers cultivate yellow maize for livestock feeding in particular during the dry season. Grinded maize is used for feeding of sheep, goats and cattle. Farmers also cultivate sweet sorghum (Imfe), useful for livestock feeding. Other crops include pumpkin (Amathanga), grown in a specific soil type; pumpkin (Senza), a variety preferred by women as they use it as a side dish for their household; squash; and sunflower (mixed with yellow maize used for chicken feeding).

[2] Organizing the seed fair was hampered by a situation of social unrest in the municipality. This situation was likely the main reason for the relatively low number of participants and villages attending the seed fair (notably in comparison with the seed fair organized in Mutale).
[3] There was no follow up visit to Spambo village.

Phelandaba covers a wide area with a number of smaller villages. Maize is the main staple crop. Farmers prefer white maize while livestock prefers yellow maize. One of the farmers at the seed fair said that he has been trying to cross maize varieties in order to produce an improved variety of mixed white and yellow colour. Most farmers select seeds post-harvest by peeling the seeds in the central part of the cobs. Apart from maize, farmers grow sorghum for beer brewing and making of 'mageu.' They noted that sorghum is drought resistant. Some farmers also grow wheat (Nqolowa-xhoza) to make bread. The seeds have been passed on by many generations. Apart from grains, farmers grow potatoes.

Photo 10: Maize diversity in Ndofela

In order to cope with the harsh environment, farmers explained that all the crops they grow are indigenous (and not modern/improved). Indigenous varieties are drought resistant as well as resistant to pests and diseases. They are also nutritious (locally termed as powerful). Farmers use local resources to cultivate the land. They noted that hybrid varieties require a lot of inputs (fertilizer and water), tend to grow tall plants and usually have a long growing period.

Trend analysis

In order to trace changes over time in terms of crop diversity, a historical trend analysis was carried out with farmers of the four villages present at the seed fair for the major and minor crops. The crops brought to the fair were compared to crops grown in the area 10 and 20 years ago, according to the memory of the farmers. The results can be seen in Table 4.

Table 4: Crop diversity trend analysis in Sterkspruit

Major crops	**2013**	**10 years ago**	**20 years ago**
	white maize	white maize	white maize
	yellow maize	yellow maize	
	sorghum	sorghum	
			sweet sorghum
	pumpkin		pumpkin
	peas	peas	peas
	beans	beans	bean
		potato	potato
	wheat	wheat	wheat
		cowpea	cowpea
			tobacco
Minor crops	2013	10 years ago	20 years ago
			yellow maize
	sweet sorghum	sweet sorghum	
		pumpkin	
	potato		
	cowpea		

The table indicates that crop preferences have changed over time. Some crops that were considered important 20 years ago as major crops are considered minor in 2013 (sweet sorghum, potato). Some crops that were minor 20 years ago have become major in 2013 (yellow maize). The number of major crops seems to be on the decline. According to the farmers of the four villages, major crops have shifted to minor crops because seeds have been lost and continue to deteriorate. They stated that it is not easy to maintain pure and healthy varieties. This has led to a loss of interest in indigenous varieties aggravated by worsening climatic conditions and a lack of resources. Other difficulties to maintain seeds on-farm that farmers mentioned in the survey include pests and diseases, bird attacks,

rodents, drought, weeds, damaged caused by roaming livestock and a lack of proper tools and machinery. At the same time, it can be observed that modern varieties have made little headway. Farmers explained that apart from the fact that they cannot afford them, they often do not perform well.

Four cell analysis in the villages

The numbers of farmers that carried out the four cell analyses were small (see photo 11). This means that the information presented in the tables 5-7 cannot be considered to be representative of the villages. However, the farmers who took part in the analyses confirmed that the crop patterns that emerged from the analyses are common. Not included in the analyses are fruits, such as apple, apricot, grape, peach, prickle pear and quince (ikwepile) that play an important role in the farming systems. Also not discussed are the roles of the animals.

Table 5: Four cell analysis in Ndofela

Small area / Many households - *pumpkin*: staple food to replace mealie in times of need; tasty and powerful/nutritious; leafes are consumable as side dish - *watermelon*: snack; seeds are scarce; plagued by theft - *turnip* (rubber): side dish; goat feed (during lactation) - *cabbage*: side dish; seed easily available - spinach: side dish; seed easily available - *onion*: side dish; seed easily available - *tomato*: side dish; seed easily available - *potato*: side dish; seed easily available	**Large area / Many households** - *white maize* (maplanka): staple food; pest resistant - *yellow maize* (maplanka): nutritious used for porridge and to feed young children; animal feed; marketing - *6 weeks maize*: very sweet and consumed as "green" mealie; used for bread making (isigezenga); extremely powerful/nutritious - *pea*: high yielding; for marketing
Large area / Few households - *3 months maize*: very robust; takes long to mature; staple food; seeds are scarce - *gasityeketye maize*: pest and drought resistant; seeds are scarce - *sorghum*: used for porridge and traditional beer (umqhomboti); chicken feed; seeds have become very scarce; requires close monitoring (bird attacks) - barley: mostly used for animal feed	**Small area / Few households** - *sweet potato*: climatic conditions unfavorable and planting materials not easily available - *sunflower*: used as chicken feed; seeds available at coop in Sterkspruit but expensive

Table 6: Four cell analysis in Qhobosane, Sjorha and Rockville

Small area / Many households - *flat pumpkin* (amaphutzi): grown close to the homestead so transportation and consumption by the whole family is easy - (*round) pumpkin* (solontsi): same as above	**Large area / Many households** **-** *white maize* (umhlophe): nutritious to human beings; staple food - *yellow maize* (ubhovu): animal feed - *red maize*: highly nutritious to livestock and human beings - *white beans*: tasty and high yielding; staple food - *peas*: tasty and good for soup making - *wheat* (ingqolowa): for bread making
Large area / Few households - *yellow-white maize*: can be consumed by people and animals	**Small area / Few households** -black maize and back0while maize: lack of seeds - *sugar beans or mixed beans*: easily infested and attacked by diseases requiring careful management and monitoring - red beans (ubovo) - *pumpkin* (amathanga a mnyama): dark green on the outside. Few seeds are available among farmers as some have lost them. - *sweet sorghum* (imfe): seeds are rare **-** *indigenous potato* (itapila): high yielding. Matured ones are harvested for consumption while smaller once are left in the soil and will re-sprout without monitoring.

Photo 11: Explaining the four cell analysis

Table 7: Four cell analysis in Dangerhoek

Small area / Many households - *pumpkin* (dark green) - *yellow pumpkin*: can replace mealie; leafs and flowers are consumable as side dish; also used to feed pigs - spinach - carrot - beetroot - *tomato*: for marketing	**Large area / Many households** - *maize*: drought resistant; early maturing; staple food - *white bean*: staple food - *pea* (ertjies): short cycle, nutritious; served as a side dish - *cowpea*: side dish - *wheat*: used for bread and beer making; also for livestock feeding
Large area / Few households - *turnip* (rubber): used for sheep feeding; bitter taste - *sorghum*: long growing cycle; used for porridge and beer making; when maturing requires close supervision (bird attacks)	**Small area / Few households** - *sunflower*: for marketing of seeds

In all villages, farmers reported the loss of one or more varieties of at least one crop, e.g., maize, sorghum. They attributed loss to various causes, including pests and diseases, waning of interest and neglect. Farmers expressed concerns about this loss and requested the NPGRC to reintroduce some of the varieties that had disappeared from the area.

Seed network analyses in the villages

To the extent possible, seed exchange patterns were mapped and discussed with the participating farmers. Seed exchanges take place in a variety of forms, among family members, neighours and friends through non-monetary means; sometimes farmers purchase seed in Sterkspruit from a shop or a street vendor when they observe an interesting variety. They rarely do obtain seeds from the extension agents. There are no government supported crop improvement activities carried out in any of the villages. In each of the villages there appear to be one or two custodian farmers who play a central role in the local seed exchange system.[4] The farmers identified as custodians during the exercise were all man. Some of the maps are presented in the photos below.

[4] For more information about custodian farmers, see: http://www.bioversityinternational.org/e-library/publications/detail/custodian-farmers-of-agricultural-biodiversity-selected-profiles-from-south-and-south-east-asia/

Photo 12: Ndopela seed network map

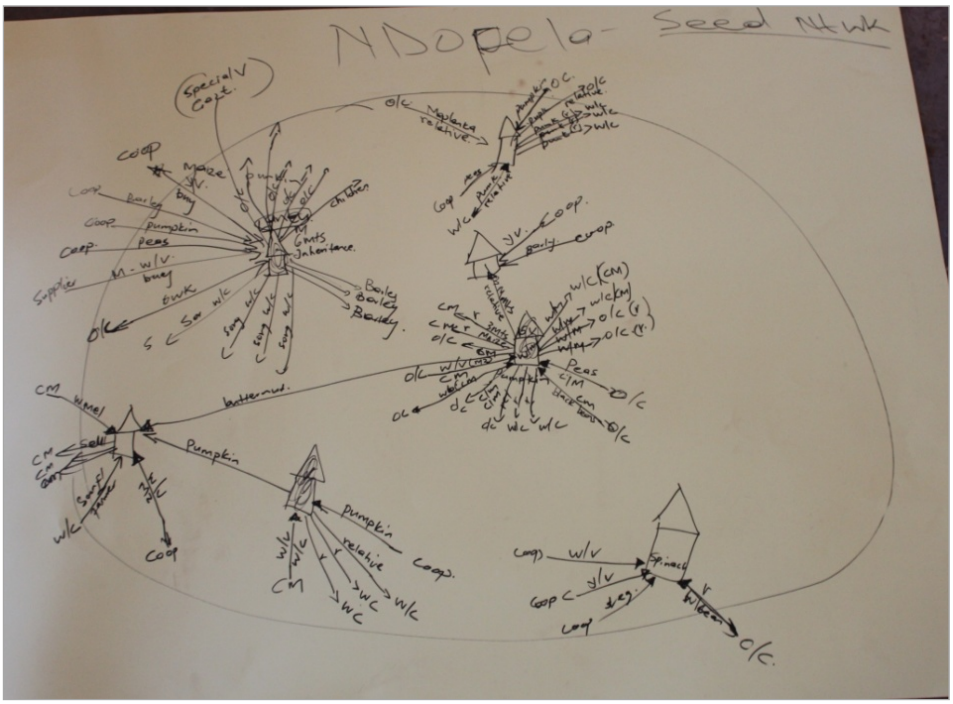
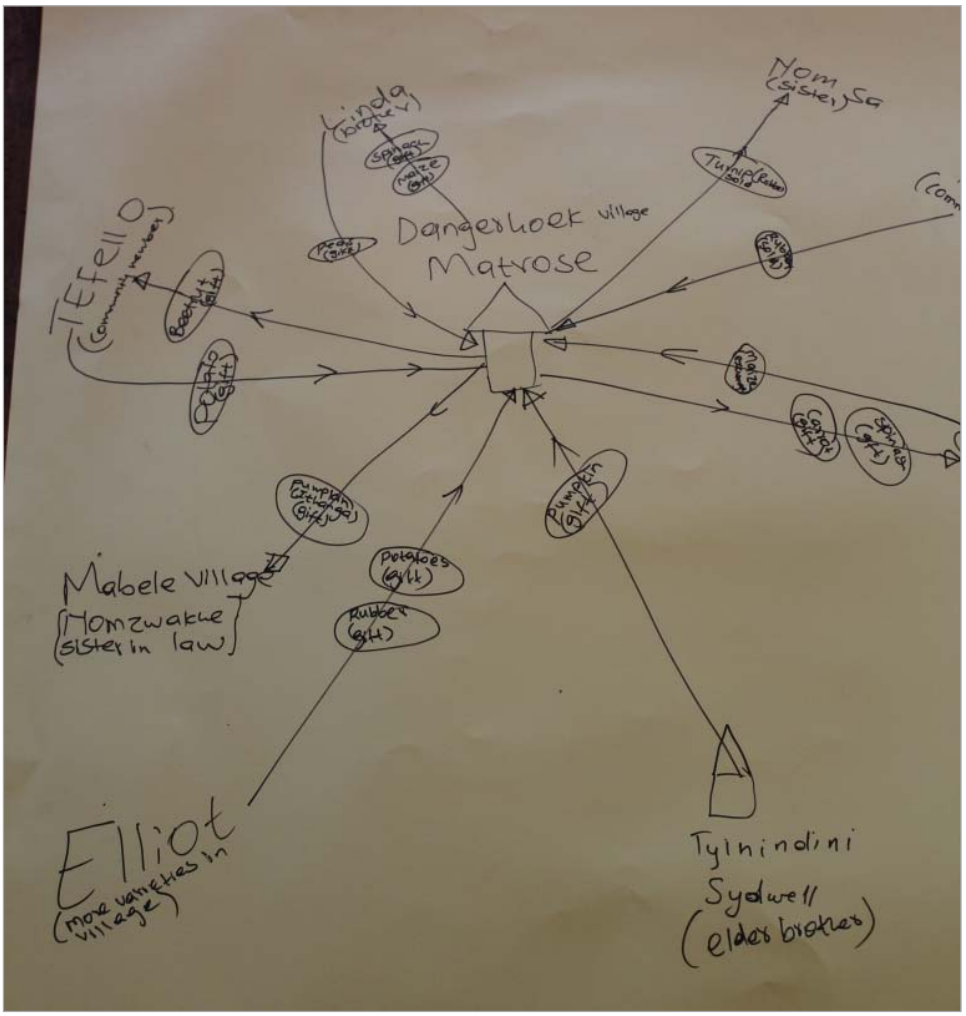


Photo 13: Dangershoek seed network map



4. Synthesis of findings

- Farmers in both regions live and work under tough conditions (low rainfall levels in both sites, cold and windy weather conditions in the mountainous areas in Eastern Cape, poor accessibility and distance from major markets in both sites), yet they still manage to make a living. They produce food mostly for subsistence, but also succeed in producing small surpluses for marketing. Their efforts merit recognition.
- Crop and varietal diversity combined with diverse animal husbandry practices (cattle, sheep and goats) is central to the farming systems and to survival in both sites.
- In both regions, farmers rely on different combinations of a few major crops grown in large areas by most households (white and yellow maize, white sorghum, millet; and groundnut in Limpopo) and on a larger number of crops grown in small areas (pumpkin, squash, beans, cowpeas, potatoes, melon, calabash, tobacco; and many fruits and vegetables in Limpopo).
- In Limpopo, it appears that women are the major custodians of seeds while in Eastern Cape it is men.
- Major reasons for maintaining diversity given by farmers (women and men) are: good taste and nutritious (the word farmers used is “powerful”), easy to combine in preparation of traditional dishes, drought resistant, resistant to pests and diseases, short growing cycle, low input, long-term storage, heritage and intercropping.
- In both regions, there are large numbers of crops grown by few households in small areas, but the diversity differs by region. These crops are likely the most threatened in terms of biodiversity loss.
- Crop diversity varies between the two regions and within each region, by village.
- Intra-species diversity for maize, sorghum and melon is relatively high but for the other crops it is low.
- Crop improvement through participatory variety selection and crossing is rare. One example of maize breeding was observed in Eastern Cape. Most of the maize varieties are creolized ones.
- In the last few decades, several crops and crop varieties have disappeared and/or seeds have become hard to obtain due to decreasing numbers of farmers producing seeds. In parallel, there seems to be weak seed networking (see below). Reasons given by farmers include increased drought, replacement of traditional varieties by modern ones (maize) and disinterest of the younger generation in farming.

- Traditional seed exchanges continue to predominate in both regions but vary considerably by village. Commercial purchase of seeds is not uncommon (from other farmers, from street vendors and from cooperatives).
- Seed networks vary by village. In some villages, multi-stranded and multi-nodal relationships predominate while in others, single-stranded and single-nodal relationships exist. It seems that exchanges are mostly based on family, friendship and church membership. In terms of distance, most exchanges are intra-village. In Limpopo, women are the main actors in the seed network, while in Eastern Cape it is men.
- Farmers mentioned that they have tried a number of modern varieties of maize and cowpea. They also mentioned that often these modern varieties do not perform well under difficult conditions.
- **Overall, findings point to: i) low intra-specific diversity; ii) weak seed exchange networks; and iii) difficult access to and availability of market-based seeds.**
- Farmers requested seeds of some “lost” varieties, in particular, sorghum and groundnut.
- Women and men farmers, in both regions, expressed interest in a community seedbank, but details were not discussed (in order not to raise expectations).

5. Recommendations

- Create mechanisms to recognize farmers' great efforts to maintain traditional crop and variety diversity (national, provincial and municipal levels), e.g., awards, incentives, etc.
- Improve access to materials at village and municipal levels through seed fairs (municipal level and village level, inter-provincial exchanges, access to national genebank materials, etc.) and through the establishment of community seedbanks (see below).
- Increase availability of seeds through improved seed management (selection, cleaning and storage) and seed production, e.g., through diversity kits, participatory variety selection, crowd-sourcing, village-based seed production and marketing.
- Create more demand for traditional crop and variety diversity, e.g., through crop improvement and adding value activities and marketing efforts (e.g., food fairs, contacts with hotels and B&B's, etc.).
- Consider carefully social and gender variables in all activities.
- Formalize cooperation between the NPGRC and the extension services at municipal level to establish a pilot community seedbank (clarifying roles and responsibilities, agreeing on funding, defining an outreach program).
- Establish one pilot community seedbank in each site and develop an initial three year management and monitoring plan. Recommended are Gubu village in Limpopo and the town of Sterkspruit in Eastern Cape. Table 8 presents the details of the assessment on which this recommendation is made.
- Develop a capacity building strategy for each pilot community seedbank (including farmers, extension services staff and NPGRC staff).
- Identify one resource person for each community seedbank who will facilitate the initial process of establishment and management.
- Train one or more NPGRC staff in agricultural biodiversity management (specialized courses or degree training).
- Develop a communications plan to "spread the word" about the pilot experiences.
- Do not wait too long for concrete follow up. Farmers may lose confidence in the NPGRC.

Table 8: Assessment of the viability of a community seedbank (CSB) in three considered sites

Factor	Mutale municipality, Limpopo	Gumbu village, Limpopo	Sterkspruit municipality, Eastern Cape
Farmers' interests	***	***	***
Farmers' leadership	**	***	*
Responsiveness to crop diversity decline	***	**	***
Building on existing seed exchange practices	**	**	***
Accessibility to seeds	**	***	**
Number of beneficiaries	***	*	***
Possibility to link CSB activities with crop improvement efforts	*	*	***
Potential to respond to impact of climate change on local farming system	***	**	***
Potential to evolve to a broader community development institution	*	***	*
Availability of sound technical support	**	*	***
Availability of a local resource person to mobilize and facilitate initial steps	*	*	***
Feasibility of building a functional facility with low cost maintenance	No data available.	No data available.	***
Enabling policy and legal environment (incentives, rewards, recognition)	**	**	**
Possibility to connect with national genebank and research agencies (exchange of seeds, cooperation)	***	**	***

***High potential. **Medium potential. * Low potential.

Annex 1: Results of survey of eight custodian farmers in Limpopo

The current working definition of custodian farmers is *farmers (men and women) who actively maintain, adapt and disseminate agricultural biodiversity and related knowledge at farm and community levels.*

1. How many different grain/vegetable/fruit types do you maintain on your farm?

Vegetable crops:	range 2-8, average 4
Grain crops:	range 0-5, average 3
Fruit types:	range 0-5, average 3
TOTAL:	range 2-16, average 9

2. Do you maintain more crop species and varieties then other households in your village?

☐ 1. No	3
☐ 2. Yes	3
☐ 3. I don't know	2

3. Do you have some very rare or special species or varieties at your farm which others don't have?

☐ 1. No	2
☐ 2. Yes	4
☐ 3. I don't know	2

4. Do you often share or exchange seeds with other farmers?

☐ 1. No	0
☐ 2. Yes	8

5. Do other farmers come to you for advice or help regarding seeds?

☐ 1. No	1
☐ 2. Yes	7

6. Do you experiment to improve your crops through making crossings?

☐ 1. No	0
☐ 2. Yes	8

Why do you maintain a wide range of different species and varieties at your farm?

7. My parents or forefathers have planted them and I want to keep it like it is.

☐ 1. Very important reason for me	8
☐ 2. Not important reason for me	0

8. I am just interested in collecting different types; it's a hobby for me.

☐ 1. Very important reason for me	6
☐ 2. Not important reason for me	2

9. I get better income by combining many different crop species and varieties as it gives me more certainty having income in different seasons and makes me less vulnerable to bad prices.

☐ 1. Very important reason for me 7
☐ 2. Not important reason for me 1

10. My family uses the fruits, seeds or leaves of some of the rare species and varieties for religious or cultural celebrations in the village or when we have family gatherings. During the celebrations fruits, seeds or leaves are consumed or used as decoration or used when we perform offerings.

☐ 1. Very important reason for me 7
☐ 2. Not important reason for me 0

11. I grow some of the rare species and varieties because they are better adapted to the local weather and soil conditions in my village than commercial types.

☐ 1. Very important reason for me 8
☐ 2. Not important reason for me 0

12. I grow some rare species and varieties because we use them mostly for home consumption as fresh fruits or processed into pickle, spice, jam or other products as food items made of the grains.

☐ 1. Very important reason for me 8
☐ 2. Not important reason for me 0

13. I am concerned about the loss of diversity, we should protect it, also the rare varieties/species that gain less income.

☐ 1. Very important reason for me 8
☐ 2. Not important reason for me 0

14. Do you think your children or a younger person will take over your conservation activities and maintain the wide range of crops that you still have?

☐ 1. No 1
☐ 2. Yes 3
☐ 3. I don't know 4

15. What are the difficulties that you face in maintaining different kinds of species and varieties, especially the rare and traditional types?

Pests (3x), water shortage (2x), drought (2x), birds, lack of land, lack of seeds, lack of machinery

16. Do you need financial support to compensate for the little income you earn from the rare species and varieties so you do not need to replace them with commercial/improved types or crops?

☐ 1. No 0
☐ 2. Yes 8
☐ 3. I don't know 0

17. Do you need technical support to be able to explore and developing new products from the rare species and varieties that earn little income now?

☐ 1. No 0
☐ 2. Yes 7
☐ 3. I don't know 0

18. Would you avoid losing rare species and varieties if you can work together with researchers to document your diversity and be involved in research?

☐ 1. No 0
☐ 2. Yes 8
☐ 3. I don't know 0

19. Do you have interest to meet-up with other farmers with diverse crops and exchange your knowledge and seeds with them?

☐ 1. No 0
☐ 2. Yes 8
☐ 3. I don't know 0

20. Do you have interest to become involved in a community seedbank to conserve and exchange local seeds?

☐ 1. No 0
☐ 2. Yes 8
☐ 3. I don't know 0

Annex 2: Results of survey of twelve custodian farmers in Sterkspruit

The current working definition of custodian farmers is *farmers (men and women) who actively maintain, adapt and disseminate agricultural biodiversity and related knowledge at farm and community levels.*

1. How many different grain/vegetable/fruit types do you maintain on your farm?

Vegetable crops:	range 2-7, average 5
Grain crops:	range 1-4, average 3
Fruit types:	range 0-4, average 1
TOTAL:	range 6-15, average 10

2. Do you maintain more crop species and varieties then other households in your village?

☐ 1. No	1
☐ 2. Yes	9
☐ 3. I don't know	2

3. Do you have some very rare or special species or varieties at your farm which others don't have?

☐ 1. No	2
☐ 2. Yes	10
☐ 3. I don't know	0

4. Do you often share or exchange seeds with other farmers?

☐ 1. No	2
☐ 2. Yes	10

5. Do other farmers come to you for advice or help regarding seeds?

☐ 1. No	0
☐ 2. Yes	12

6. Do you experiment to improve your crops through making crossings?

☐ 1. No	4
☐ 2. Yes	8

Why do you maintain a wide range of different species and varieties at your farm?

7. My parents or forefathers have planted them and I want to keep it like it is.

☐ 1. Very important reason for me	12
☐ 2. Not important reason for me	0

8. I am just interested in collecting different types; it's a hobby for me.

☐ 1. Very important reason for me	11

☐ 2. Not important reason for me 1

9. I get better income by combining many different crop species and varieties as it gives me more certainty having income in different seasons and makes me less vulnerable to bad prices.
   ☐ 1. Very important reason for me 12
   ☐ 2. Not important reason for me 0

10. My family uses the fruits, seeds or leaves of some of the rare species and varieties for religious or cultural celebrations in the village or when we have family gatherings. During the celebrations fruits, seeds or leaves are consumed or used as decoration or used when we perform offerings.
   ☐ 1. Very important reason for me 10
   ☐ 2. Not important reason for me 2

11. I grow some of the rare species and varieties because they are better adapted to the local weather and soil conditions in my village than commercial types.
   ☐ 1. Very important reason for me 10
   ☐ 2. Not important reason for me 2

12. I grow some rare species and varieties because we use them mostly for home consumption as fresh fruits or processed into pickle, spice, jam or other products as food items made of the grains.
   ☐ 1. Very important reason for me 10
   ☐ 2. Not important reason for me 2

13. I am concerned about the loss of diversity, we should protect it, also the rare varieties/species that gain less income.
   ☐ 1. Very important reason for me 12
   ☐ 2. Not important reason for me 0

14. Do you think your children or a younger person will take over your conservation activities and maintain the wide range of crops that you still have?
   ☐ 1. No 2
   ☐ 2. Yes 7
   ☐ 3. I don't know 3

15. What are the difficulties that you face in maintaining different kinds of species and varieties, especially the rare and traditional types?

   Lack of machinery and tools (5x), pests and diseases (4x), birds (4x), drought (3x), lack of seeds (1x), damage caused by livestock (1x), ants (1x), weeds (1x) water shortage (1x), theft (1x)

16. Do you need financial support to compensate for the little income you earn from the rare species and varieties so you do not need to replace them with commercial/improved types or crops?
   ☐ 1. No 1
   ☐ 2. Yes 11

☐ 3. I don't know 0

17. Do you need technical support to be able to explore and developing new products from the rare species and varieties that earn little income now?
    ☐ 1. No 1
    ☐ 2. Yes 11
    ☐ 3. I don't know 0

18. Would you avoid losing rare species and varieties if you can work together with researchers to document your diversity and be involved in research?
    ☐ 1. No 1
    ☐ 2. Yes 9
    ☐ 3. I don't know 2

19. Do you have interest to meet-up with other farmers with diverse crops and exchange your knowledge and seeds with them?
    ☐ 1. No 0
    ☐ 2. Yes 12
    ☐ 3. I don't know 0

20. Do you have interest to become involved in a community seedbank to conserve and exchange local seeds?
    ☐ 1. No 0
    ☐ 2. Yes 12
    ☐ 3. I don't know 0

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